UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SN

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. |
|---|---|---|---|
| 09/321,390 | 05/27/99 | LESIEUR | R |

IM22/0604

WILLIAM W JONES
6 JUNIPER LANE
MADISON CT 06443

| EXAMINER | |
|---|---|
| RIDLEY, B | |
| ART UNIT | PAPER NUMBER |
| 1764 | 11 |

DATE MAILED: 06/04/01

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Paper No. 11

Application Number: 09/321,390
Filing Date: May 27, 1999
Appellant(s): LESIEUR, ROGER R.



William W. Jones
For Appellant

**EXAMINER'S ANSWER**

This is in response to appellant's brief on appeal filed 26 March 2001.

***(1) Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

*(2) Related Appeals and Interferences*

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

While the appellant states that there are no related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal, it appears that application 09/332,415 is such related appeal.

*(3) Status of Claims*

The statement of the status of the claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

This appeal involves claims 1-7, 9-19 and 21-22.

Claims 1 and 21 have been substituted for the finally rejected claims.

Claim 22 has been amended subsequent to the final rejection.

Claims 8 and 20 have been canceled.

*(4) Status of Amendments After Final*

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

*(5) Summary of Invention*

The summary of invention contained in the brief is correct.

*(6) Issues*

The appellant's statement of the issues in the brief is substantially correct. The changes are as follows:

Regarding "A. Does the use of the phrase "catalyzed cells" render the specification unclear?", the examiner notes that objection to specification regarding use of the phrase "catalyzed cells" has been overcome by Amendment filed on 19 January 2001.

Regarding "C. Does the use of the phrase "catalyzed cells" in Claims 1, 21 and 22 render these claims indefinite?", the examiner notes that rejection of said claims regarding use of the phrase "catalyzed cells" has been overcome by Amendment filed on 19 January 2001.

Regarding "D. Does the inclusion of the phrase "the processed gas stream" in Claims 1 and 21 render these claims indefinite?", the examiner notes that rejection of claim 1 regarding use of the phrase "the processed gas stream" has been overcome by Amendment filed on 19 January 2001.

*(7) Grouping of Claims*

The appellant's statement in the brief that certain claims do not stand or fall together is not agreed with because, while the appellant states that "Claims 1-13 and 16-19 stand or fall together; Claims 14 and 15 stand or fall together; and Claims 21 and 22 stand or fall together.", the appellant does not present arguments directed towards patentability of said three sets of claims. Instead, the appellant presents arguments directed toward the following four sets of claims:

- 1-6, 9-12 and 16-18;
- 13-15;
- 1, 7 and 21-22;
- 19.

It is presumed that the rejection of claims 1-7, 9-19 and 21-22 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

*(8) Claims Appealed*

The copy of the appealed claims contained in the Appendix to the brief is correct.

*(9) Prior Art of Record*

| | | |
|---|---|---|
| USP 4,308,233 | Narumiya et al. | 29 December 1981 |
| USP 4,415,484 | Setzer et al. | 15 November 1983 |
| USP 4,451,578 | Setzer et al. | 29 May 1984 |
| USP 5,110,780 | Peters | 5 May 1992 |
| USP 5,384,099 | Sheller | 24 January 1995 |
| USP 5,498,370 | Bhattacharyya et al. | 12 March 1996 |
| WO 98/08771 | Clawson | 5 March 1998 |

*(10) Grounds of Rejection*

The following ground(s) of rejection are applicable to the appealed claims:

/. Claim(s) 1-7, 9-18 and 21-22 is/are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which appellant(s) regard(s) as the invention.

Claim(s) 1 and 21-22 recite(s) the limitation(s) "the fuel gas", line(s) 4 of said claim(s). There is insufficient antecedent basis for said limitation(s) in the claim(s). Proposed correction is to replace "the fuel gas" with --a fuel gas--.

Claim(s) 21 recite(s) the limitation(s) "the processed fuel gas stream", line(s) 12-13. There is insufficient antecedent basis for said limitation(s) in the claim(s) as more than one processed fuel gas stream is recited prior to said limitation(s) (e.g. "a processed fuel gas stream disposed in an outlet passage from said catalyst bed" recited in line(s) 8-9 of claim 21 and "processed fuel gas

stream" being disposed in heat exchange relationship with an air inlet passage recited in line(s) 11-12 of claim 21). Proposed correction is to replace "processed fuel gas stream" in line(s) 12, first occurrence, with --the processed fuel gas stream--.

4. Claim(s) 19 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson (WO 98/08771) in view of Narumiya et al. (USP 4,308,233).

Regarding claim(s) 19, Clawson disclose(s) a similar autothermal reformer assembly (Fig. 3), said assembly comprising:

a) a catalyst bed (200) including an inlet end (210) and an outlet end (270);

b) a fuel gas/steam mixture inlet passage (208, P20/L7-9); and

c) a fuel gas reforming catalyst (225) deposited in said catalyst bed (200).

While Clawson discloses using supported catalyst in the catalyst bed, the reference does not explicitly disclose said catalyst being supported on a cylindrical monolithic open cell foam.

Narumiya et al. teaches a catalyst bed comprising a cylindrical monolithic open cell foam structure (Fig. 1, C4/L30-32).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the fuel gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas.

3. Claim(s) 1-6, 9-12 and 16-18 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson (WO 98/08771) in view of Narumiya et al. (USP 4,308,233) and further in view of Setzer et al. (USP 4,415,484).

Regarding claim(s) 1 and 16, Clawson disclose(s) similar autothermal reformer assembly (Fig. 3), said assembly comprising:

a) a catalyst bed (200) including an inlet end (210) and an outlet end (270), an inlet portion of said catalyst bed being operable to combust a portion of the fuel gas (P24/L1-7);

b) a fuel gas inlet passage (208), said fuel gas inlet passage (208) being disposed in heat exchange relationship with a processed fuel gas stream disposed in an outlet passage from said catalyst bed, whereby heat will be transferred to said fuel gas inlet passage from the processed fuel gas stream (P20/L9-11 & P21/L7-10);

c) an air inlet passage (232), said air inlet passage (232) being disposed in heat exchange relationship with the processed fuel gas stream whereby heat from the processed fuel gas stream will be transferred to said air inlet passage (P22/13-15); and

d) a fuel gas reforming catalyst (225) deposited in said catalyst bed (200).

While Clawson discloses using supported catalyst in the catalyst bed, the reference does not explicitly disclose said catalyst being supported on a cylindrical monolithic open cell foam.

Narumiya et al. teaches a catalyst bed comprising a cylindrical monolithic open cell foam structure (Fig. 1, C4/L30-32).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the fuel gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas.

While Clawson discloses combusting a portion of the fuel gas in an inlet portion of the catalyst bed, the reference does not explicitly disclose said catalyst bed being provided with a catalyst which is operable to combust said portion of the fuel gas.

Setzer et al. teaches an autothermal reformer assembly wherein an inlet portion of a catalyst bed is provided with a catalyst that is operable to combust a portion of the fuel gas (C4/L42-52).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a catalyst which is operable to combust a portion of the fuel gas, as taught by Setzer et al., in the inlet portion of the catalyst bed of Clawson, for the purpose of allowing greater flexibility in the maximum allowable reactor temperature and the method of introducing air into the reactor.

Regarding claim(s) 2-5, Clawson in view of Narumiya et al. and further in view of Setzer et al. disclose(s) all of the claim limitations as set forth above. Additionally Setzer et al. teaches the autothermal reformer assembly, wherein:

- said catalyst bed includes a noble metal and calcium oxide (C2/L5-6);
- said catalyst bed comprises at least two catalyzed regions (C4/L59-63), wherein each region has a different catalyst composition (C4/L59-63);
- a first region of said catalyst bed contains a noble metal catalyst in combination with calcium oxide (C3/L21-22 & C4/L53-55);
- a second region of said foam catalyst bed contains a base metal catalyst in combination with calcium oxide (C3/L20-21 & C4/L45-46).

Regarding claim(s) 6 and 9, Clawson in view of Narumiya et al. and further in view of Setzer et al. disclose(s) all of the claim limitations as set forth above. Additionally, while the

reference(s) does/do not explicitly disclose(s) said first region containing platinum catalyst and said second region containing nickel catalyst, both nickel and platinum catalysts were well known in the art at the time the invention was made (as evidenced by Clawson, P19/L27-P20/L7), with catalyst selection being driven by system requirements, such as desired catalyst activity, and by catalyst cost. As the instant specification is silent to unexpected results, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use platinum catalyst in said first region and nickel catalyst in said second region of the catalyst bed disclosed by Clawson in view of Narumiya et al. and further in view of Setzer et al., for the purpose of obtaining desired catalyst activity.

Regarding claim(s) 10-11, Clawson in view of Narumiya et al. and further in view of Setzer et al. disclose(s) all of the claim limitations as set forth above. Additionally Setzer et al. teaches the autothermal reformer assembly, wherein:

- said catalyst bed includes a first region which contains a noble metal catalyst and calcium oxide catalyst (C4/L53-55);
- said noble metal catalyst is selected from the group consisting of platinum, palladium, rhodium and mixtures thereof (C4/L53-55).

While Clawson in view of Narumiya et al. and further in view of Setzer et al. do not explicitly disclose said second region containing noble metal catalyst and not containing calcium oxide, noble metal catalysts which do not contain calcium oxide were well known in the art at the time the invention was made (as evidenced by Clawson, P19/L27-P20/L7), with catalyst selection being driven by system requirements, such as desired catalyst activity, and by catalyst cost. As the instant specification is silent to unexpected results, it would have been obvious to one having

ordinary skill in the art at the time the invention was made to use noble metal catalyst not containing calcium oxide in said second region of the catalyst bed disclosed by Clawson in view of Narumiya et al. and further in view of Setzer et al., for the purpose of obtaining desired catalyst activity.

Regarding claim(s) 12, Clawson in view of Narumiya et al. and further in view of Setzer et al. disclose(s) all of the claim limitations as set forth above. Additionally Narumiya et al. teaches the catalyst bed wherein said catalyst bed includes at least one ceramic foam support body (C2/L45-49).

Regarding claim(s) 17-18, Clawson in view of Narumiya et al. and further in view of Setzer et al. disclose(s) all of the claim limitations as set forth above. Additionally Clawson discloses the autothermal reformer assembly, wherein:

- said fuel gas inlet passage contains a fuel gas/steam mixture (P23/L8-14);
- said air inlet passage contains air (P23/L19-22).

While Clawson in view of Narumiya et al. and further in view of Setzer et al. do not explicitly disclose said air inlet passage containing an air/steam mixture, the usage of steam as a temperature modifier and to avoid soot formation in partial oxidation of hydrocarbons was well known in the art at the time the invention was made (as evidenced by Bhattacharyya et al., USP 5,498,370). As the instant specification is silent to unexpected results, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add steam to said air inlet passage disclosed by Clawson in view of Narumiya et al. and further in view of Setzer et al., for the purpose of using said steam as a temperature modifier and to avoid soot formation.

4. Claim(s) 13-15 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson (WO 98/08771) in view of Narumiya et al. (USP 4,308,233) and further in view of Setzer et al. (USP 4,415,484), as applied to claim(s) 1-6, 9-12 and 16-18 above, and further in view of Sheller (USP 5,384,099).

Regarding claim(s) 13-15, Clawson in view of Narumiya et al. and further in view of Setzer et al. disclose(s) all of the claim limitations as set forth above, but the references do not explicitly disclose the catalyst bed comprising a metal support selected from the group consisting of stainless steel, nickel alloys and iron-aluminum alloys, said support being connected to a source of electrical current so as to serve as a resistance heating element during start-up of said reformer assembly by being electrically heated to operating temperatures within about twenty seconds after applying electrical current thereto.

Sheller teaches a monolithic catalyst bed, wherein:

- said catalyst bed includes a metal support selected from the group consisting of stainless steel, nickel alloys and iron-aluminum alloys (C1/L26-29);
- said metal support is connected to a source of electrical current, so as to serve as a resistance heating element (C1/L52-63);
- said metal support is electrically heated to operating temperatures within about twenty seconds after applying electrical current thereto (C1/L65-66).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a metal support connected to a source of electrical current, as taught by Sheller, in the assembly of Clawson in view of Narumiya et al. and further in view of Setzer et al., for the purpose of activating the catalyst during the start up of the reformer.

5. Claim(s) 1, 7 and 21 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson (WO 98/08771) in view of Narumiya et al. (USP 4,308,233) and further in view of Setzer et al. (USP 4,451,578).

Regarding claim(s) 1, Clawson disclose(s) similar autothermal reformer assembly (Fig. 3), said assembly comprising:

a) a catalyst bed (200) including an inlet end (210) and an outlet end (270), an inlet portion of said catalyst bed being operable to combust a portion of the fuel gas (P24/L1-7);

b) a fuel gas inlet passage (208), said fuel gas inlet passage (208) being disposed in heat exchange relationship with a processed fuel gas stream disposed in an outlet passage from said catalyst bed, whereby heat will be transferred to said fuel gas inlet passage from the processed fuel gas stream (P20/L9-11 & P21/L7-10);

c) an air inlet passage (232), said air inlet passage (232) being disposed in heat exchange relationship with the processed fuel gas stream whereby heat from the processed fuel gas stream will be transferred to said air inlet passage (P22/13-15); and

d) a fuel gas reforming catalyst (225) deposited in said catalyst bed (200).

While Clawson discloses using supported catalyst in the catalyst bed, the reference does not explicitly disclose said catalyst being supported on a cylindrical monolithic open cell foam.

Narumiya et al. teaches a catalyst bed comprising a cylindrical monolithic open cell foam structure (Fig. 1, C4/L30-32).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the

fuel gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas.

While Clawson discloses combusting a portion of the fuel gas in an inlet portion of the catalyst bed, the reference does not explicitly disclose said catalyst bed being provided with a catalyst which is operable to combust said portion of the fuel gas.

Setzer et al. teaches an autothermal reformer assembly wherein an inlet portion of a catalyst bed is provided with a catalyst that is operable to combust a portion of the fuel gas (C5/L53-59).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a catalyst which is operable to combust a portion of the fuel gas, as taught by Setzer et al., in the inlet portion of the catalyst bed of Clawson, for the purpose of allowing greater flexibility in the maximum allowable reactor temperature and the method of introducing air into the reactor.

Regarding claim(s) 7, Clawson in view of Narumiya et al. and further in view of Setzer et al. disclose(s) all of the claim limitations as set forth above. Additionally Setzer et al. teaches the autothermal reformer assembly, wherein said first region contains an iron oxide/calcium oxide catalyst, and said second region contains a nickel catalyst (C5/L53-61).

Regarding claim(s) 21, Clawson disclose(s) a similar autothermal reformer assembly (Fig. 3), said assembly comprising:

a) a catalyst bed (200) including an inlet end (210) and an outlet end (270), an inlet portion of said catalyst bed is operable to combust a portion of the fuel gas (P24/L1-7);

b) a fuel gas inlet passage (208), said fuel gas inlet passage (208) being disposed in heat exchange relationship with a processed fuel gas stream disposed in an outlet passage from said catalyst bed,

whereby heat will be transferred to said fuel gas inlet passage from the processed fuel gas stream (P20/L9-11 & P21/L7-10);

c) an air inlet passage (232), said air inlet passage (232) being disposed in heat exchange relationship with the processed fuel gas stream whereby heat from the processed fuel gas stream will be transferred to said air inlet passage (P22/13-15); and

d) a fuel gas reforming catalyst (225) deposited in said catalyst bed (200).

While Clawson discloses using supported catalyst in the catalyst bed, the reference does not explicitly disclose said catalyst being supported on a monolithic open cell foam.

Narumiya et al. teaches a catalyst bed comprising a monolithic open cell foam structure (Fig. 1, C4/L30-32).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the fuel gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas.

While Clawson discloses combusting a portion of the fuel gas in an inlet portion of the catalyst bed, the reference does not explicitly disclose said catalyst bed being provided with a catalyst which is operable to combust said portion of the fuel gas.

Setzer et al. teaches an autothermal reformer assembly wherein an inlet portion of a catalyst bed is provided with a catalyst which is operable to combust a portion of the fuel gas (C5/L53-59) and wherein said catalyst bed is provided with promoted catalyst (C2/L29-30).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a catalyst which is operable to combust a portion of the fuel gas, as taught by Setzer et al., in the inlet portion of the catalyst bed of Clawson, for the purpose of allowing greater flexibility in the maximum allowable reactor temperature and the method of introducing air into the reactor.

While Setzer et al. does disclose the catalyst bed being provided with promoted catalyst, the reference does not explicitly disclose the catalyst being promoted with a noble metal which is operable to combust a portion of the fuel gas at a temperature of about 500°F.

As promoters containing noble metal were well known in the art at the time the invention was made (as evidenced by Peters, USP 5,110,780), and as the instant specification is silent to unexpected results, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a noble metal-promoted catalyst which is operable to combust a portion of the fuel gas at a temperature of about 500°F in the assembly disclosed by Clawson in view of Narumiya et al. and further in view of Setzer et al. for the purpose of increasing catalyst activity and lowering operation temperature.

4. Claim(s) 22 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Setzer et al. (USP 4,451,578) in view of Narumiya et al. (USP 4,308,233).

Setzer et al. discloses a similar autothermal reformer assembly comprising:

- a catalyst bed (C5/L41);
- an inlet portion of said catalyst bed being provided with promoted catalyst (C2/L29-30), which is operable to combust a portion of the fuel gas (C5/L54-59).

While Setzer et al. discloses using a supported catalyst in the catalyst bed, the reference does not explicitly disclose the catalyst being supported on a monolithic open cell foam.

Narumiya et al. teaches a catalyst bed comprising a monolithic open cell foam structure (Fig. 1, C4/L30-32).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Setzer et al., for the purpose of providing structure which allows the fuel gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas.

While Setzer et al. does not explicitly disclose the catalyst bed having an inlet end and an outlet end, these elements are inherent in the disclosed assembly.

While Setzer et al. discloses the catalyst bed being provided with promoted catalyst, the reference does not explicitly disclose the bed being promoted with a noble metal catalyst which is operable to combust a portion of the fuel gas at a temperature of about 500°F.

As promoters containing noble metal, were well known in the art at the time the invention was made (as evidenced by Peters, USP 5,110,780), and as the instant specification is silent to unexpected results, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a noble metal-promoted catalyst which is operable to combust a portion of the fuel gas at a temperature of about 500°F in the catalyst bed disclosed by Setzer et al. in view of Narumiya et al. for the purpose of increasing catalyst activity and lowering operation temperature.

***(11) Response to Argument***

***1. Response to Arguments Regarding Claim Rejections Under 35 U.S.C. 112***

The appellant's arguments regarding the issue of examiner's educational background and/or work experience is not one of the issues under consideration, but rather what evidence does the appellant have to support his/her position. Appellant is advised to direct comments to the merits of the rejections or objections. See *In re Nilssen* 7 USPQ 2d 1500.

The appellant argues that rejection of claims 1 and 21-22 due to use of "the fuel gas" is "clearly erroneous", as phrase "fuel gas" is recited in line 1 of each of said claims.

In response the examiner would like to point out that while recitation "A hydrocarbon fuel gas autothermal reformer assembly", as recited in line 1 of claims 1 and 21-22, does establish antecedent basis for a reformer assembly, it does not do so for fuel gas. Currently, "fuel gas" is not positively recited in any of said claims.

The appellant states that rejection of claims 1 and 21 due to use of "the processed gas stream" has been overcome by amendment is not correct, as only rejection to claim 1 has been overcome by said amendment.

***2. Response to Arguments Regarding Rejection of Claim 19 Under 35 U.S.C. 103***

The appellant argues that there is not motivation to substitute the Narumiya et al. catalyst bed for the Clawson catalyst bed because it appears that reformer of Clawson does not have problems which would be solved by catalyst bed which allows the process gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas. Further the appellant argues that one would not be likely to use an oxidizing catalyst bed in a steam reformer, because if one did make such substitution the result would be to

oxidize or burn all of the hydrocarbons in the fuel gas, which would be an undesirable result in steam reformer.

The examiner notes that Narumiya et al. was not relied upon to teach substituting a catalyst bed of Narumiya et al. for catalyst bed of Clawson or using an oxidizing catalyst in a steam reformer.

The examiner has however relied on the disclosure of Narumiya et al. to teach a cylindrical monolithic open cell foam structure (Fig. 1, C4/L30-32) which can be used as a support for any catalyst (either oxidizing catalyst or steam reforming catalyst or any other catalyst). Since both references disclose use of supported noble metal catalyst (see Clawson P19/L29-P20/L7 and P21/L13-17 and Narumiya et al. C2/L45-55) it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a monolithic open cell foam structure, as taught by Narumiya et al., as a support for the catalyst in the assembly of Clawson, for the purpose of providing structure which allows the process gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas (Narumiya et al., C2/L24-31).

In response to appellant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case Narumiya et al., in C2/L24-31, states that disclosed catalyst structure allows the process gas to always be in

contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas. Since said catalyst support structure improves conversion, it will enhance performance of any catalytic device (either oxidizing or steam reforming or any other). Additionally, it is generally known in the art that use of monolithic cell foam structure, as disclosed by Narumiya et al., as a catalyst support not only increases mechanical strength (see Narumiya et al., C2/L24-31), but also render the device using said catalyst support lighter and more compact. Since both, the instant invention and Clawson (P2/L1-5 and P5/L19-24), are concerned with making a steam reformer lighter and more compact, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the light and compact reformer design of Clawson with even lighter and more compact catalyst support of Narumiya et al, as one of ordinary skill in the art at the time the invention was made would recognize that a catalyst support can be used for various catalysts without changing the principles of their catalytic activity, and therefore, when looking for modification of said catalyst support, one of ordinary skill in the art would utilize teachings regarding said catalyst support which can be found in various applications, and not just in one specific application, such as steam reforming.

In response to appellant's argument that the examiner is not considering the reference as a whole, but rather "picking and choosing parts of the teachings" in support of the rejection, the examiner would like to point out that test for obviousness is not whether all the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the instant case,

the combined teachings of the references would suggest that it was well known in the art at the time the invention was made to use monolithic open cell foam support for a catalyst (including noble metal catalyst, see Narumiya et al. C2/L45-55), said support providing structure which allows process gas to always be in contact with the surface of the catalyst to accelerate gas diffusion and to prevent the direct passage of unreacted gas (Narumiya et al., C2/L24-31) and for the purpose of making the assembly using said catalyst even lighter and more compact.

3. ***Response to Arguments Regarding Rejection of Claims 1-6, 9-12 and 16-18 Under 35 U.S.C. 103***

The appellant argues that the examiner's analysis of Clawson is incorrect, because numeral 208 in Clawson denotes initial portion of catalyst bed filled with catalyst 214 and not a fuel gas inlet, said fuel gas inlet being denoted by numeral 219. Therefore, as the fuel gas inlet passage 219 is not disposed in heat exchange relationship with processed gas passage, the pre-heating of the fuel gas stream as claimed in instant application does not occur.

In response the examiner notes that Fig. 3 of Clawson shows a first passage, within tube 208, for receiving a mixture of steam and a first hydrocarbon or alcohol fuel (P20/L7-9). Therefore said first passage is "a fuel gas inlet passage" as recited in rejected claims. Further, said Fig. 3 shows a second passage, located between tubes 208 and 218 which continues between tubes 218 and 224 which continues between tubes 224 and 252 and which further continues between tubes 252 and 202, for transferring a processed fuel gas stream to reformer outlet (P19/L19-P23/L7). Therefore said second passage is "an outlet passage" in which "a processed fuel gas stream" is disposed as recited in rejected claims. Therefore, as it can be seen in Fig. 3, said first passage is disposed in heat exchange relationship with said second passage. Additionally, as reaction occurring in said first passage is an endothermic steam reforming reaction (P19/L25-29) and a

reaction occurring in said second passage is an exothermic partial oxidation reaction (P24/L1-13) the heat from said second passage "will be transferred" to said first passage, again, as recited in rejected claims.

Additionally, the examiner notes that the instant claim language: "a hydrocarbon fuel gas autothermal reformer assembly comprising (...)" does not distinguish between the instant invention and the reformer assembly disclosed by Clawson, as said language does not exclude reformer assemblies wherein a fuel gas inlet passage further comprises a catalyst.

Further, the examiner would like to point out that passage 219 of Clawson is also disposed in heat exchange relationship with processed fuel gas stream outlet passage (second passage, as set forth above), since passage 219 comes in contact with reformer 200 and reformer 200 comprises said processed fuel gas stream outlet passage. Therefore there is a heat exchange between said passage 219 and said processed fuel gas stream outlet passage.

In response to appellant's argument that the references fail to show certain features of appellant's invention, the examiner notes that the features upon which appellant relies (i.e., pre-heating of the fuel gas) are not recited in the rejected claim(s), as said claims merely recite heat exchange relationship, "whereby heat will be transferred to said fuel gas inlet passage from the processed gas stream". Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The examiner would like to point out that recitation of "heat (being) transferred" to a passage, as recited in the instant claims, is much more broad than recitation of pre-heating a gas stream in said passage, since transferred heat can be utilized for many different purposes (e.g. for maintaining passage temperature constant or for evaporating passage contents)

and not necessarily for pre-heating of said passage contents. Additionally, the examiner would like to point out that Clawson does, in fact, disclose the fuel gas in said first passage, as set forth above, being pre-heated (see P23/L16-18).

The appellant's arguments regarding "Examiner's allegation that the catalyst tube 208 is disposed in heat exchange relationship with the processed fuel gas stream outlet passage, which is disposed between tubes 224 and 252" are not persuasive, since the examiner has not made such allegation.

Further, the appellant argues that the motivation for combining two references must be found in the prior art. This is not found persuasive, since the obviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Additionally, the examiner would like to point out that the motivation statement in question (that substituting catalyst arrangement of Setzer et al. in the assembly of Clawson for the purpose of allowing greater flexibility in the maximum allowable reactor temperature and the method of introducing air into the reactor) can be found in the references themselves (see Setzer et al. '484, C4/L63-66).

The appellant's arguments regarding "allusions to the apparent need for unexpected results" allegedly made by the examiner are not persuasive, as the appellant have not provided any evidence that the instantly claimed invention has unexpected results. The examiner would like to point out

that it would be obvious to substitute equivalent and known in the art elements, process steps or arrangements, unless the claimed invention has unexpected results.

With respect to appellant's arguments regarding the reference of Narumiya et al. the same response applies as set forth above.

4. ***Response to Arguments Regarding Rejection of Claims 13-15 Under 35 U.S.C. 103***

The appellant argues that one of ordinary skill in the art would not use the teaching of Sheller for heating a monolith, as Sheller suggests that monoliths could not be satisfactorily electrically heated due to their low electrical resistance. This is not found persuasive, because the reference of Sheller teaches that it was well known in the art to use a catalyst bed supported on a monolith, wherein said monolith includes a metal support selected from the group consisting of stainless steel, nickel alloys and iron-aluminum alloys (C1/L26-29) and wherein said metal support is connected to a source of electrical current, so as to serve as a resistance heating element (C1/L52-63) and wherein said metal support is electrically heated to operating temperatures within about twenty seconds after applying electrical current thereto (C1/L65-66). Further, while the reference does state that many of said electrically heatable monoliths might not prove satisfactory when exposed to very stringent automotive industry durability tests (C2/L12-16), they were useful in less stringent environment (C2/L65-66). The examiner notes that the test for obviousness is not whether all the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the instant case, it would have been obvious to one having ordinary skill in the art

at the time the invention was made to provide a metal support connected to a source of electrical current, as taught by Sheller, in the assembly of Clawson in view of Narumiya et al. and further in view of Setzer et al., for the purpose of activating the catalyst during the start up of the reformer.

With respect to appellant's arguments regarding the reference of Narumiya et al. the same response applies as set forth above.

5,16. ***Response to Arguments Regarding Rejection of Claims 1, 7 and 21-22 Under 35 U.S.C. 103***

With respect to appellant's arguments regarding the reference of Narumiya et al. the same response applies as set forth above.

The appellant argues that the rejection of claim 7 is erroneous, because Setzer et al. '578 does not teach an iron oxide/calcium oxide catalyst mixture, but only an iron oxide catalyst. This is not found persuasive, because said reference, in C5/L53-61, teaches an autothermal reformer comprising an inlet portion including "iron oxide catalyst according to the present invention". As can be seen from the actual descriptions of "catalysts according to the present invention" throughout said reference (e.g. Abstract), said catalyst comprises iron oxide/calcium oxide catalyst mixture, as recited in rejected claim 7.

The appellant arguments that the examiner has ignored limitations that follow the phrase "operable to" are not found persuasive. The examiner has not only not ignored said limitations, but, by not relying upon said reference combination to disclose a reformer assembly which combusts a portion of the fuel gas at a temperature of about 500°F and by relying upon said reference combination to disclose reformer assembly which is operable to combust a portion of the fuel gas at a temperature of about 500°F, the examiner has treated said limitations literally as recited in rejected claims. Again, the examiner would like to point out that the term "operable" means "being

such that use or operation is possible" (*The American Heritage® Dictionary of the English Language, Third Edition* copyright © 1992 by Houghton Mifflin Company; Electronic version licensed from INSO Corporation). Even though the limitation of "reformer assembly being operable (...)" is not a positive limitation in any patentable sense, but only requires possibility of said operation (see *In re Hutchison*, 69 USPQ 138), it is examiner's position that: as combustion of a portion of the fuel gas stream at a temperature of about 500°F does not impart any further structural limitations on the reformer assemblage disclosed by said combination of references, and as said reformer assemblage, as set forth above, has the same structure and catalyst combination as the instantly claimed invention, said reformer assemblage is, in fact, operable to combusts a portion of the fuel gas at a temperature of about 500°F.

***Response to Arguments Regarding Non-Analogous Arts***

The appellant argues that the references of Narumiya et al. and Sheller are non-analogous, and that one seeking to solve the problem solved by the instant invention would not be likely to consult catalytic converter art for a solution.

In response to said argument, the examiner would like to point out that it has been held that a prior art reference must either be in the field of appellant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the appellant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

In this case, both, the instant invention (P3/L9-P7/L11) and Clawson (P2/L1-5 and P5/L19-24), are concerned with making a steam reformer lighter and more compact. Further, the instant invention (P3/L9-P7/L11) is concerned with allowing for quick (within about 20 seconds) start-up

of said reformer by bringing catalyst in said reformer to operating temperatures. These are the particular problems that are being solved by the instant invention.

Narumiya et al. and Sheller teach a catalyst support that can be used to support noble metal catalyst. Said support was well known in the art to render assemblies using said support lighter and more compact and to allow for electrical heating to quickly bring said catalyst to operating temperatures. Therefore the references of Narumiya et al. and Sheller are reasonably pertinent to the particular problem with which the appellant was concerned.

Further, it is examiner's position that one of ordinary skill in the art at the time the invention was made would recognize that catalyst support and means for heating said support can be used in various catalyst applications without changing principles of operation of catalyst which is being supported on said support. Therefore, when looking for modification of said catalyst support, one of ordinary skill in the art would utilize teachings regarding said catalyst support which can be found in various applications, and not just in one specific application, such as steam reforming.

***(12) Conclusion***

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Basia Ridley
Examiner
Art Unit 1764

BR
June 1, 2001

WILLIAM W JONES
6 JUNIPER LANE
MADISON, CT 06443

MARIAN C. KNODE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700